Variations in Deceased Donor Terminal Creatinine Values Reported in the OPTN Data Registry

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Deceased donor terminal serum creatinine impacts kidney allocation as part of the Kidney Donor Risk Index (KDRI) and influences acceptance decisions as an important indicator of donor kidney function (1). The final predonation creatinine is captured alongside multiple other creatinine values through DonorNet, an online system that allows organ procurement organizations (OPOs) to communicate point-in-time information for transplant hospital users to evaluate and respond to deceased donor organ offers (2). Terminal creatinine is also reported on Deceased Donor Registration Forms, which OPOs submit to the Organ Procurement and Transplantation Network (OPTN) after completing the DonorNet organ disposition form (3). Research on organ procurement and utilization relies primarily on creatinine values entered into Deceased Donor Registration Forms because they are available in standard analytical files, while DonorNet creatinine values are used for research about donor acute kidney injury and the real-time evaluation of organ offers (1). Terminal creatinine from these sources should be identical, but congruence of these data in the OPTN registry has not been previously assessed.

We compared Deceased Donor Registration Form terminal creatinine provided in the United Network for Organ Sharing (UNOS) Standard Transplant and Analysis Research file based on OPTN data as of March 15, 2019 to the final creatinine reported in DonorNet as of January 24, 2020. From January 1, 2006 to December 31, 2018, we identified 107,768 donors with Deceased Donor Registration Form and DonorNet creatinine values reported. We excluded donors with implausible reported creatinine values (<0.1 or >40 mg/dl, n=400), donors without kidney donation consent (n=1,045), donors with kidneys recovered for nontransplant reasons (n=867), procurements restricted by the medical examiner (n=66), and donors with only an intestine or pancreas recovered (n=1), for a final cohort of 105,388 donors. KDRI was calculated separately based on terminal creatinine values in the two datasets and mapped onto a cumulative percentage scale using the 2017 scaling factor to generate the Kidney Donor Profile Index (KDPI) (1).

Approximately one in four (24.6%, n=25,914) donors had a Deceased Donor Registration Form terminal creatinine that differed from the DonorNet final creatinine. Over one in ten of these donors (n=3386) had a difference in terminal creatinine of at least 0.3 mg/dl. The overall proportion of donors with discordant creatinine values decreased from 65% in 2006 to 8% in 2018 (Figure 1). Most of these donors (56.0%, n=14,523) had a Deceased Donor Registration Form terminal creatinine that was lower than the DonorNet final creatinine, including 4372 donors whose Deceased Donor Registration Form terminal creatinine was lower than the minimum creatinine at any time point in DonorNet. The absolute percentage difference in terminal creatinine ranged from 0.06% to 9900% (or a maximum of 800% when excluding outliers, defined as an absolute difference in terminal creatinine >5 mg/dl or a clear decimal error in reporting [n=161]), with a median (interquartile range, IQR) that decreased from 15% (10%–25%) in 2006 to 9% (5%–26%) in 2018 (Figure 1). For 11,067 donors, the absolute percentage difference was greater than 10%. For 35 donors, differences in terminal creatinine values were clearly attributable to decimal errors, *e.g.*, 8 rather than 0.8 or 0.32 rather than 32. The discrepancies resulted in a crossover of 762 donors between the terminal creatinine categories <2 mg/dl and ≥2 mg/dl, which is a common threshold used by transplant centers for being bypassed on organ offers. Among 16,915 donors with differences in calculated KDPI values, the absolute difference ranged from 1 to 25 with a median (IQR) of 2 (1–3). The discrepancies led to a crossover of 4577 donors into a different KDPI interval, and 388 donors between KDPI categories <85% and ≥85%.

Our findings demonstrate inconsistencies in DonorNet and Deceased Donor Registration Form terminal creatinine values. Although creatinine discrepancies were present throughout the study period, they decreased after the launch of DonorNet in 2006. They fell further from 2012 to 2013, likely reflecting higher data scrutiny with the addition of KDPI to DonorNet in 2012 and the value of even minor efforts to ensure accuracy, such as limiting data entry in DonorNet to biologically plausible creatinine ranges. Nonetheless, individual- and system-based errors continue to impact donor risk stratification through the KDRI and KDPI, and potentially influence subsequent analyses of clinical decision making. Most registry-based analyses incorporate Deceased Donor Registration Form

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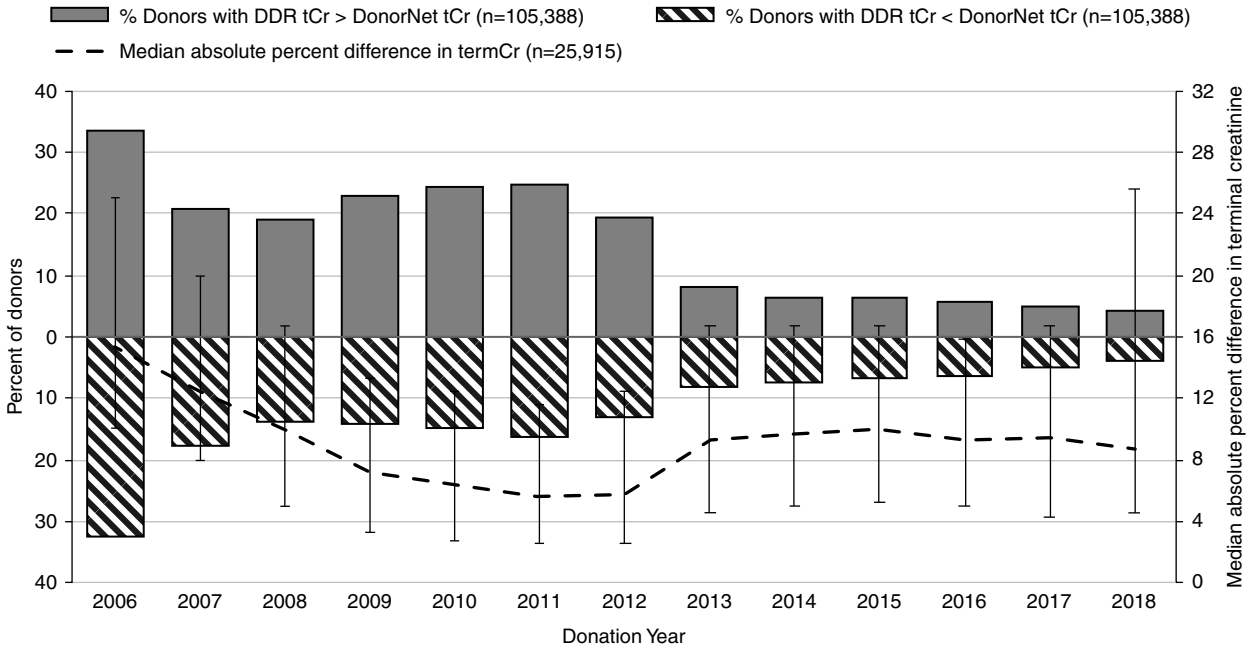

Figure 1. | **Percent of donors with discordant terminal creatine values and median absolute percent difference in terminal creatinine values.** The time series bar chart (primary vertical axis) shows the percentage of donors with discordant terminal creatinine values by donation year (n=105,388). The positive vertical axis represents the percentage of donors whose Deceased Donor Registration Form terminal creatinine was greater than the terminal creatinine in DonorNet (11%, n=11,391) (solid gray). The negative vertical axis represents the percentage of donors whose Deceased Donor Registration Form terminal creatinine was less than the terminal creatinine in DonorNet (14%, n=14,523) (diagonal lines). The overall percentage of donors with discordant terminal creatinine values decreased from 65% in 2006 to 8% in 2018. The line graph (secondary vertical axis) shows the median absolute percentage difference in terminal creatinine by donation year for donors with discrepant terminal creatinine values (n=25,915). The error bars represent the interquartile range (IQR). The median (IQR) absolute percentage difference in terminal creatinine decreased from 15% (10%–25%) in 2006 to 9% (5%–26%) in 2018. DDR, Deceased Donor Registration; tCr, terminal creatinine.

data provided in UNOS Standard Transplant and Analysis Research files (1). However, DonorNet data are useful when assessing how kidneys are allocated and used because they reflect information available to OPOs and transplant centers at the time of decision making. The OPTN registry supports extensive transplantation research efforts, including large-scale prospective studies (4). Studies attempting to understand the impact of donor AKI on post-transplant outcomes or decision processes at the time of organ offer, and policies based on this research, are most likely to be adversely impacted. Given the extent of discrepancies in data crucial to organ allocation, these results might also raise concerns about the accuracy of other data reported to the OPTN and the potential for regional variations in reporting accuracy. Our findings underscore the urgent need for meaningful quality improvement efforts, such as investment in data validation technologies, to support the OPTN registry, which is an invaluable resource for the field of transplantation (5).

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Author Contributions

S. Husain, K. King, S. Mohan, and K. Yu conceptualized the study, were responsible for formal analysis and methodology, and reviewed and edited the manuscript; S. Husain, S. Mohan, and K. Yu were responsible for investigation; S. Husain and S. Mohan provided supervision; K. King and K. Yu were responsible for data curation; and S. Mohan and K. Yu wrote the original draft.

Data Sharing Statement

The data that support the findings of this study are available *via* request to the Organ Procurement and Transplantation Network.

References

1. Organ Procurement and Transplantation Network: A Guide to Calculating and Interpreting the Kidney Donor Profile Index (KDPI). Available at: https://optn.transplant.hrsa.gov/media/1512/guide_to_calculating_interpreting_kdpi.pdf. Accessed September 10, 2021
2. Gerber DA, Arrington CJ, Taranto SE, Baker T, Sung RS: DonorNet and the potential effects on organ utilization. *Am J Transplant* 10: 1081–1089, 2010
3. Organ Procurement and Transplantation Network: OPTN Policies: Policy 18: Data Submission Requirements. Available at: https://optn.transplant.hrsa.gov/media/eavh5bf3/optn_policies.pdf. Accessed September 10, 2021
4. Freedman BI, Moxey-Mims MM, Alexander AA, Astor BC, Birdwell KA, Bowden DW, Bowen G, Bromberg J, Craven TE, Dadhania DM, Divers J, Doshi MD, Eidbo E, Fornoni A, Gautreaux MD, Gbadegesin RA, Gee PO, Guerra G, Hsu CY, Iltis AS, Jefferson N, Julian BA, Klassen DK, Koty PP, Langefeld CD, Lentine KL, Ma L, Mannon RB, Menon MC, Mohan S, Moore JB, Murphy B, Newell KA, Odim J, Ortigosa-Goggins M, Palmer ND, Park M, Parsa A, Pastan SO, Poggio ED, Rajapakse N, Reeves-Daniel AM, Rosas SE, Russell LP, Sawinski D, Smith SC, Spainhour M, Stratta RJ, Weir MR, Reboussin DM, Kimmel PL, Brennan DC: *APOL1* Long-term Kidney Transplantation Outcomes Network (APOLLO): Design and rationale. *Kidney Int Rep* 5: 278–288, 2019
5. Tsapepas D, King KL, Husain SA, Mohan S: Evaluation of kidney allocation critical data validity in the OPTN registry using dialysis dates. *Am J Transplant* 20: 318–319, 2020

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